PATENT & TRADEMARK OFFICE
FEB 24 2003

#16

SEQUENCE LISTING

<110> BOURSAUX-EUDE, CAROLINE
GUISO-MACLOUF, NICOLE

<120> POLYPEPTIDES CONTAINING POLYMORPHISMS OF THE REPEATED REGIONS OF PERTACTIN IN BORDETELLA PERTUSSIS, BORDETELLA PARAPERTUSSIS, AND BORDETELLA BRONCHISEPTICA, THEIR USE IN DIAGNOSTICS, AND IN IMMUNOGENIC COMPOSITIONS

<130> 03495-0206-00000

<140> 09/855,754
<141> 2001-05-16

<150> 60/206,969
<151> 2000-05-25

<160> 25

<170> PatentIn Ver. 2.1

<210> 1
<211> 3000
<212> DNA
<213> Bordetella bronchiseptica

<400> 1
atcgatgatg cgtcgctgta acacggcaaa taccgtgcat tgcagcggtt ctggatggcg 60
ttcttcgtac gtttgctgcg cccattcttc cctgttccat cgcggtgcgg ccatggcggg 120
cgtctgctct tcacccggca tccaatgaac atgtctctgt cacgcattgt cttggcggcg 180
cccctgcgcc gcaccacact ggccatggcg ctgggcgcgc tgggcgccgc gcccgccgcg 240
tacgccgact ggaacaacca gtccatcatc aaggccggcg agcgccagca cggcatccac 300
atcaagcaaa gcgatggcgc cggcgtacgg accgccaccg gaacgaccat caaggtaagc 360
ggtcgtcagg cccagggcgt cctgctggaa aatcccgcgg ccgagctgcg gttccagaac 420
ggcagcgtca cgtcttcggg acagctgttc gacgaaggcg tccggcgctt tctgggcacc 480
gtcaccgtca aggccggcaa gctggtcgcc gatcacgcca cgctggccaa cgtcagcgac 540
acccgggacg acgacggcat cgcgctctat gtggccggcg agcaggccca ggccagcatc 600
gccgacagca ccctgcaggg cgcgggcggc gtgcgggtcg agcgcggcgc caatgtcacg 660
gtccaacgca gcaccatcgt tgacgggggc ttgcatatcg gcaccctgca gccgctgcag 720
ccggaagacc ttccgcccag ccgggtggtg ctgggcgaca ccagcgtgac cgccgtgccc 780
gccagcggcg cgcccgcggc ggtgtctgta ttcggggcca atgagcttac ggttgatggc 840
gggcacatca ccgggggggcg ggcagcgggg gtggcggcca tggacggggc gatcgtgcat 900
ctgcagcgcg cgacgatacg gcgggggggac gcgcctgccg gcggtgcggt tccaggcggt 960
gctgttcccg gcggcttcgg ccccctcctt gacggctggt atggcgtgga tgtatcggat 1020
tccaccgtgg acctcgctca gtcgatcgtc gaggcgccgc agctgggcgc cgcgatccgg 1080
gcgggccgcg gcgccagggt gacggtgtcg ggcggcagct tgtccgcacc gcacggcaat 1140
gtcatcgaga ccggcggcgg cgcgcgtcgc ttcccgcctc cggcctcgcc cctgtcgatc 1200
accttgcagg cgggcgcacg ggcgcagggg agggcgctgc tgtaccgggt cctgccggag 1260
cccgtgaagc tgacgctggc gggcggcgcc caggggcagg gcgacatcgt cgcgacggag 1320
ctgcctccca ttccaggcgc gtcgagcggg ccgctcgacg tggcgctggc cagccaggcc 1380
cgatggacgg gcgctacccg cgcggtcgac tcgctgtcca tcgacaacgc cacctgggtc 1440
atgacggaca actcgaacgt cggcgcgctg cggctggcca gcgacggcag cgtcgatttc 1500
cagcagccgg ccgaagctgg gcggttcaag tgcctgatgg tcgatacgct ggcgggttcg 1560
gggctgttcc gcatgaatgt cttcgcggac ctggggctga gcgacaagct ggtcgtcatg 1620
cgggacgcca gcggccagca caggctgttg gtccgcaaca gcggcagcga gccggccagc 1680
ggcaacacca tgctgctggt gcagacgcca cgaggcagcg cggcgacctt tacccttgcc 1740

aacaaggacg gcaaggtcga tatcggtacc taccgctatc gattggccgc caacggcaat 1800
gggcagtgga gcctggtcgg cgcgaaggcg ccgccggcgc ccaagcccgc gccgcagccc 1860
ggtccccagc ccggtcccca gccgccgcag ccgccgcagc cgccgcagcc gccacagagg 1920
cagccggaag cgccggcgcc gcaaccgccg gcgggcaggg agttgtccgc cgccgccaac 1980
gcggcggtca acacgggtgg ggtgggcctg gccagcacgc tctggtacgc cgaaagcaat 2040
gcgttgtcca agcgcctggg cgagttgcgc ctgaatccgg acgccggcgg cgcttggggc 2100
cgcggcttcg cgcaacgcca gcaactggac aaccgcgccg ggcggcgctt cgaccagaag 2160
gtggccggct tcgagctggg cgccgaccac gcggtggcgg tggccggcgg gcgctggcac 2220
ctgggcgggc tggccggcta tacgcgcggc gaccgcggct ttaccggcga cggcggcggc 2280
cacaccgaca gcgtgcatgt cgggggctat gccacctata tcgccaacag cggtttctac 2340
ctggacgcga cgctgcgcgc cagccgcctc gaaaatgact tcaaggtggc gggcagcgat 2400
gggtacgcgg tcaagggcaa gtaccgcacc catggggtag gcgcctcgct cgaggcgggc 2460
cggcgcttcg cccatgccga cggctggttc ctcgagccgc aggccgagct ggcggtgttc 2520
cgggtcggcg gcggttcgta ccgcgcggcc aatggcctgc gggtgcgcga cgaaggcggc 2580
agctcggtgc tgggtcgcct gggcctggag gtcggcaagc gcatcgaact ggcaggcggc 2640
aggcaggtgc agccatacat caaggccagc gtgctgcagg agttcgacgg cgcgggtacg 2700
gtacgcacca acggcatcgc gcaccgcacc gaactgcgcg gcacgcgcgc cgaactgggc 2760
ctgggcatgg ccgccgcgct gggccgcggc cacagcctgt atgcctcgta cgagtactcc 2820
aagggcccga agctggccat gccgtggacc ttccacgcgg gctaccggta cagctggtaa 2880
agcgagaagg gtccatcccc ccgcgggggа gattttcctg gaggttggcc ggtgccagtc 2940
tccaggctca ggcggccagg gcgtgcgggc cgggcaggcc gtgctggtgc tggccgaacc 3000

<210> 2
<211> 2733
<212> DNA
<213> Bordetella pertussis

<400> 2
atgaacatgt ctctgtcacg cattgtcaag gcggcgcccc tgcgccgcac cacgctggcc 60
atggcgctgg gcgcgctggg cgccgccccg gcggcgcatg ccgactggaa caaccagtcc 120
atcgtcaaga ccggtgagcg ccagcatggc atccatatcc agggctccga cccgggcggc 180
gtacggaccg ccagcggaac caccatcaag gtaagcggcc gtcaggccca gggcatcctg 240
ctagaaaatc ccgcggccga gctgcagttc cggaacggca gtgtcacgtc gtcgggacag 300
ttgtccgacg atggcatccg gcgctttctg ggcaccgtca ccgtcaaggc cggcaagctg 360
gtcgccgatc acgccacgct ggccaacgtt ggcgacacct gggacgacga cggcatcgcg 420
ctctatgtgg ccggcgaaca ggcccaggcc agcatcgccg acagcaccct gcagggcgct 480
ggcggcgtgc agatcgagcg cggcgccaat gtcacggtcc aacgcagcgc catcgtcgac 540
gggggcttgc atatcggcgc cctgcagtca ttgcagccgg aagaccttcc gcccagccgg 600
gtggtgctgc gcgacaccaa cgtgaccgcc gtgcccgcca gcggcgcgcc cgcggcggtg 660
tctgtgttgg gggccagtga gcttacgctc gacggcgggc acatcaccgg cgggcgggca 720
gcgggggtgg cggccatgca aggggcggtc gtgcatctgc agcgcgcgac gatacggcgc 780
ggggacgcgc ctgccggcgg tgcggttccc ggcggtgcgg ttcccggtgg tgcggttccc 840
ggcggcttcg gtcccggcgg cttcggtccc gtcctcgacg gctggtatgg cgtggacgta 900
tcgggctcca gcgtggagct cgcccagtcg atcgtcgagg cgccggagct gggcgccgca 960
atccgggtgg gccgcggcgc cagggtgacg gtgtcgggcg gcagcttgtc cgcaccgcac 1020
ggcaatgtca tcgagaccgg cggcgcgcgt cgctttgcgc ctcaagccgc gcccctgtcg 1080
atcaccttgc aggccggcgc gcatgcccag gggaaagcgc tgctgtaccg ggtcctgccg 1140
gagcccgtga agctgacgct gaccgggggc gccgatgcgc agggcgacat cgtcgcgacg 1200
gagctgccct ccattcccgg cacgtcgatc gggccgctcg acgtggcgct ggccagccag 1260
gcccgatgga cgggcgctac ccgcgcggtc gactcgctgt ccatcgacaa cgccacctgg 1320
gtcatgacgg acaactcgaa cgtcggtgcg ctacggctgg ccagcgacgg cagcgtcgat 1380
ttccagcagc cggccgaagc tgggcggttc aaggtcctga cggtcaatac gctggcgggt 1440
tcggggctgt tccgcatgaa tgtcttcgcg gacctggggc tgagcgacaa gctggtcgtc 1500
atgcaggacg ccagcggcca gcacaggctg tgggtccgca acagcggcag cgagccggcc 1560
agcgccaaca ccctgctgct ggtgcagacg ccacgaggca gcgcggcgac ctttaccctt 1620
gccaacaagg acggcaaggt cgatatcggt acctatcgct atcgattggc cgccaacggc 1680
aatgggcagt ggagcctggt gggcgcgaag gcgccgccgg cgcccaagcc cgcgccgcag 1740

ccgggtcccc agccgccgca gccgccgcag ccgcagccgg aagcgccggc gccgcaaccg 1800
ccggcgggca gggagttgtc cgccgccgcc aacgcggcgg tcaacacggg tggggtgggc 1860
ctggccagca cgctctggta cgccgaaagc aatgcgttgt ccaagcgcct gggcgagttg 1920
cgcctgaatc cggacgccgg cggcgcctgg ggccgcggct tcgcgcaacg ccagcagctg 1980
gacaaccgcg ccgggcggcg cttcgaccag aaggtggccg gcttcgagct gggcgccgac 2040
cacgcggtgg cggtggccgg cggacgctgg cacctgggcg ggctggccgg ctatacgcgc 2100
ggcgaccgcg gcttcaccgg cgacggcggc ggccacaccg acagcgtgca tgtcgggggc 2160
tatgccacat atatcgccga cagcggtttc tacctggacg cgacgctgcg cgccagccgc 2220
ctggagaatg acttcaaggt ggcgggcagc gacgggtacg cggtcaaggg caagtaccgc 2280
acccatgggg tgggcgcctc gctcgaggcg ggccggcgct ttacccatgc cgacggctgg 2340
ttcctcgagc cgcaggccga gctggcggta ttccgggccg gcggcggtgc gtaccgcgcg 2400
gccaacggcc tgcgggtgcg cgacgaaggc ggcagctcgg tgctgggtcg cctgggcctg 2460
gaggtcggca agcgcatcga actggcaggc ggcaggcagg tgcagccata catcaaggcc 2520
agcgtgctgc aggagttcga cggcgcgggt acggtacaca ccaacggcat cgcgcaccgc 2580
accgaactgc gcggcacgcg cgccgaactg ggcctgggca tggccgccgc gctgggccgc 2640
ggccacagcc tgtatgcctc gtacgagtac tccaagggcc cgaagctggc catgccgtgg 2700
accttccacg cgggctaccg gtacagctgg taa 2733

<210> 3
<211> 3116
<212> DNA
<213> Bordetella parapertussis

<400> 3
atcgatgatg cgtcgctgta acacggcaaa taccgtgcat tgcagcggtt ctggatggcg 60
ttcttcgtac gtttgctgcg cccattcttc cctgttccat cgcggtgcgg gcatggcggg 120
cgtctgctct tcacccggca tccaatgaac atgtctctgt cacgcattgt caaggcggcg 180
cccctgcgcc gcaccacact ggccatggcg ctgggcgcgc tgggcgccgc gcccgccgcg 240
tacgccgact ggaacaacca gtccatcatc aaggccggcg agcgccagca cggcatccac 300
atcaagcaaa gcgatggcgc cggcgtacgg accgccaccg gaacgaccat caaggtaagc 360
ggtcgtcagg cccagggcgt cctgctggaa aatcccgcgg ccgagctgcg gttccagaac 420
ggcagcgtca cgtcttcggg acagctgttc gacgaaggcg tccggcgctt tctgggcacc 480
gtcaccgtca aggccggcaa gctggtcgcc gatcacgcca cgctggccaa cgtcagcgac 540
acccgggacg acgacggcat cgcgctctat gtggccggcg agcaggccca ggccagcatc 600
gccgacagca ccctgcaggg cgcgggcggc gtgcgggtcg agcgcggcgc caatgtcacg 660
gtccaacgca gcaccatcgt tgacgggggc ttgcatatcg gcaccctgca gccgctgcag 720
ccggaagacc ttccgcccag ccgggtggtg ctgggcgaca ccagcgtgac cgccgtgccc 780
gccagcggcg cgcccgcggc ggtgtttgta ttcggggcca atgagcttac ggttgatggc 840
gggcacatca ccgggggcg ggcagcgggg gtggcggcca tggacggggc gatcgtgcat 900
ctgcagcgcg cgacgatacg gcgggggac gcgcctgccg gcggtgcggt tccaggcggt 960
gcggttcccg gcggtgccgt tcccggcggc ttcggccccc tccttgacgg ctggtatggc 1020
gtggatgtat cggactccac cgtggacctc gctcagtcga tcgtcgaggc gccgcagctg 1080
ggcgccgcga tccgggcggg ccgcggcgcc agggtgacgg tgtcgggcgg cagcttgtcc 1140
gcaccgcacg gcaatgtcat cgagaccggc ggcggtgcgc gtcgcttccc gcctccggcc 1200
tcgcccctgt cgatcacctt gcaggcgggc gcacgggcgc aggggagggc gctgctgtac 1260
cgggtcctgc cggagcccgt gaagctgacg ctggcgggcg gcgcccaggg gcagggcgac 1320
atcgtcgcga cggagctgcc tcccattcca ggcgcgtcga gcgggccgct cgacgtggcg 1380
ctggccagcc aggcccgatg gacgggcgct acccgcgcgg tcgactcgct gtccatcgac 1440
aacgccacct gggtcatgac ggacaactcg aacgtcggcg cgctgcggct ggccagcgac 1500
ggcagcgtcg atttccagca gccggccgaa gctgggcggt tcaaggtcct gatggtcgat 1560
acgctggcgg gttcggggct gttccgcatg aatgtcttcg cggacctggg gctgagcgac 1620
aagctggtcg tcatgcggga cgccagcggc cagcacaggc tgtgggtccg caacagcggc 1680
agcgagccgg ccagcggcaa caccatgctg ctggtgcaga cgccacgagg cagcgcggcg 1740
acctttaccc ttgccaacaa ggacggcaag gtcgatatcg gtacctaccg ctatcgattg 1800
gccgccaacg gcaatgggca gtggagcctg gtgggcgcga aggcgccgcc ggcgcccaag 1860
cccgcgccgc agcccggtcc ccagcccggt ccccagccgc cgcagccgcc gcagccgccg 1920
cagccgccgc agccgccgca gccgccacag aggcagccgg aagcgccggc gccgcaaccg 1980

```
ccggcgggca gggagttgtc cgccgccgcc aacgcggcgg tcaacacggg tggggtgggc 2040
ctggccagca cgctctggta cgccgaaagc aatgcgttgt ccaagcgcct gggcgagttg 2100
cgcctgaatc cggacgccgg cggcgcttgg ggccgcggct tcgcgcaacg ccagcaactg 2160
gacaaccgcg ccgggcggcg cttcgaccag aaggtggccg gcttcgagct gggcgccgac 2220
cacgcggtgg cggtggccgg cgggcgctgg cacctgggcg ggctggccgg ctatacgcgc 2280
ggcgaccgcg gctttaccgg cgacggcggc ggccacaccg acagcgtgca tgtcgggggc 2340
tatgccacct atatcgccaa cagcggtttc tacctggacg cgacgctgcg cgccagccgc 2400
ctcgaaaatg acttcaaggt ggcgggcagc gatgggtacg cggtcaaggg caagtaccgc 2460
acccatgggg taggcgtctc gctcgaggcg ggccggcgct tcgcccatgc cgacggctgg 2520
ttcctcgagc cgcaggccga gctggcggtg ttccgggtcg gcggcggtgc gtaccgcgcg 2580
gccaatggcc tgcgggtgcg cgacgaaggc ggcagctcgg tgctgggtcg cctgggcctg 2640
gaggtcggca agcgcatcga actggcaggc ggcaggcagg tgcagccata catcaaggcc 2700
agcgtgttgc aggagttcga cggcgcgggt acggtacgca ccaacggcat cgcgcatcgc 2760
accgaactgc gcggcacgcg cgccgaactg ggcctgggca tggccgccgc gctgggccgc 2820
ggccacagcc tgtatgcctc gtacgagtac tccaagggcc cgaagctggc catgccgtgg 2880
accttccacg cgggctaccg gtacagctgg taaagcgaga agggtccatc ccccgcggag 2940
gagtttttcc tggaggttgg ccggtgccag tctccaggct caggcggcca gggcctgcgg 3000
gccgggcagg ccgtgctggt gctggccgaa ccattgcaca gggtgttcgg ccaagggcgg 3060
cgacttcgcc gatgaccagc aacgccgggg ggcgcacgct gcgccggcgc gcgatc     3116
```

<210> 4
<211> 911
<212> PRT
<213> Bordetella bronchiseptica

<400> 4

```
Met Asn Met Ser Leu Ser Arg Ile Val Leu Ala Ala Pro Leu Arg Arg
  1               5                  10                  15

Thr Thr Leu Ala Met Ala Leu Gly Ala Leu Gly Ala Ala Pro Ala Ala
             20                  25                  30

Tyr Ala Asp Trp Asn Asn Gln Ser Ile Ile Lys Ala Gly Glu Arg Gln
         35                  40                  45

His Gly Ile His Ile Lys Gln Ser Asp Gly Ala Gly Val Arg Thr Ala
     50                  55                  60

Thr Gly Thr Thr Ile Lys Val Ser Gly Arg Gln Ala Gln Gly Val Leu
 65                  70                  75                  80

Leu Glu Asn Pro Ala Ala Glu Leu Arg Phe Gln Asn Gly Ser Val Thr
                 85                  90                  95

Ser Ser Gly Gln Leu Phe Asp Glu Gly Val Arg Arg Phe Leu Gly Thr
            100                 105                 110

Val Thr Val Lys Ala Gly Lys Leu Val Ala Asp His Ala Thr Leu Ala
        115                 120                 125

Asn Val Ser Asp Thr Arg Asp Asp Asp Gly Ile Ala Leu Tyr Val Ala
    130                 135                 140

Gly Glu Gln Ala Gln Ala Ser Ile Ala Asp Ser Thr Leu Gln Gly Ala
145                 150                 155                 160
```

```
Gly Gly Val Arg Val Glu Arg Gly Ala Asn Val Thr Val Gln Arg Ser
                165                 170                 175

Thr Ile Val Asp Gly Gly Leu His Ile Gly Thr Leu Gln Pro Leu Gln
            180                 185                 190

Pro Glu Asp Leu Pro Pro Ser Arg Val Val Leu Gly Asp Thr Ser Val
        195                 200                 205

Thr Ala Val Pro Ala Ser Gly Ala Pro Ala Ala Val Ser Val Phe Gly
    210                 215                 220

Ala Asn Glu Leu Thr Val Asp Gly Gly His Ile Thr Gly Gly Arg Ala
225                 230                 235                 240

Ala Gly Val Ala Ala Met Asp Gly Ala Ile Val His Leu Gln Arg Ala
                245                 250                 255

Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val Pro Gly Gly
            260                 265                 270

Ala Val Pro Gly Gly Phe Gly Pro Leu Leu Asp Gly Trp Tyr Gly Val
        275                 280                 285

Asp Val Ser Asp Ser Thr Val Asp Leu Ala Gln Ser Ile Val Glu Ala
    290                 295                 300

Pro Gln Leu Gly Ala Ala Ile Arg Ala Gly Arg Gly Ala Arg Val Thr
305                 310                 315                 320

Val Ser Gly Gly Ser Leu Ser Ala Pro His Gly Asn Val Ile Glu Thr
                325                 330                 335

Gly Gly Gly Ala Arg Arg Phe Pro Pro Pro Ala Ser Pro Leu Ser Ile
            340                 345                 350

Thr Leu Gln Ala Gly Ala Arg Ala Gln Gly Arg Ala Leu Leu Tyr Arg
        355                 360                 365

Val Leu Pro Glu Pro Val Lys Leu Thr Leu Ala Gly Gly Ala Gln Gly
    370                 375                 380

Gln Gly Asp Ile Val Ala Thr Glu Leu Pro Pro Ile Pro Gly Ala Ser
385                 390                 395                 400

Ser Gly Pro Leu Asp Val Ala Leu Ala Ser Gln Ala Arg Trp Thr Gly
                405                 410                 415

Ala Thr Arg Ala Val Asp Ser Leu Ser Ile Asp Asn Ala Thr Trp Val
            420                 425                 430

Met Thr Asp Asn Ser Asn Val Gly Ala Leu Arg Leu Ala Ser Asp Gly
        435                 440                 445

Ser Val Asp Phe Gln Gln Pro Ala Glu Ala Gly Arg Phe Lys Cys Leu
    450                 455                 460
```

```
Met Val Asp Thr Leu Ala Gly Ser Gly Leu Phe Arg Met Asn Val Phe
465                 470                 475                 480

Ala Asp Leu Gly Leu Ser Asp Lys Leu Val Val Met Arg Asp Ala Ser
                485                 490                 495

Gly Gln His Arg Leu Leu Val Arg Asn Ser Gly Ser Glu Pro Ala Ser
            500                 505                 510

Gly Asn Thr Met Leu Leu Val Gln Thr Pro Arg Gly Ser Ala Ala Thr
        515                 520                 525

Phe Thr Leu Ala Asn Lys Asp Gly Lys Val Asp Ile Gly Thr Tyr Arg
    530                 535                 540

Tyr Arg Leu Ala Ala Asn Gly Asn Gly Gln Trp Ser Leu Val Gly Ala
545                 550                 555                 560

Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro Gln Pro
                565                 570                 575

Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg
            580                 585                 590

Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser
        595                 600                 605

Ala Ala Ala Asn Ala Ala Val Asn Thr Gly Gly Val Gly Leu Ala Ser
    610                 615                 620

Thr Leu Trp Tyr Ala Glu Ser Asn Ala Leu Ser Lys Arg Leu Gly Glu
625                 630                 635                 640

Leu Arg Leu Asn Pro Asp Ala Gly Gly Ala Trp Gly Arg Gly Phe Ala
                645                 650                 655

Gln Arg Gln Gln Leu Asp Asn Arg Ala Gly Arg Arg Phe Asp Gln Lys
            660                 665                 670

Val Ala Gly Phe Glu Leu Gly Ala Asp His Ala Val Ala Val Ala Gly
        675                 680                 685

Gly Arg Trp His Leu Gly Gly Leu Ala Gly Tyr Thr Arg Gly Asp Arg
    690                 695                 700

Gly Phe Thr Gly Asp Gly Gly Gly His Thr Asp Ser Val His Val Gly
705                 710                 715                 720

Gly Tyr Ala Thr Tyr Ile Ala Asn Ser Gly Phe Tyr Leu Asp Ala Thr
                725                 730                 735

Leu Arg Ala Ser Arg Leu Glu Asn Asp Phe Lys Val Ala Gly Ser Asp
            740                 745                 750

Gly Tyr Ala Val Lys Gly Lys Tyr Arg Thr His Gly Val Gly Ala Ser
        755                 760                 765
```

```
Leu Glu Ala Gly Arg Arg Phe Ala His Ala Asp Gly Trp Phe Leu Glu
    770                 775                 780

Pro Gln Ala Glu Leu Ala Val Phe Arg Val Gly Gly Gly Ser Tyr Arg
785                 790                 795                 800

Ala Ala Asn Gly Leu Arg Val Arg Asp Glu Gly Gly Ser Ser Val Leu
                805                 810                 815

Gly Arg Leu Gly Leu Glu Val Gly Lys Arg Ile Glu Leu Ala Gly Gly
            820                 825                 830

Arg Gln Val Gln Pro Tyr Ile Lys Ala Ser Val Leu Gln Glu Phe Asp
        835                 840                 845

Gly Ala Gly Thr Val Arg Thr Asn Gly Ile Ala His Arg Thr Glu Leu
    850                 855                 860

Arg Gly Thr Arg Ala Glu Leu Gly Leu Gly Met Ala Ala Ala Leu Gly
865                 870                 875                 880

Arg Gly His Ser Leu Tyr Ala Ser Tyr Glu Tyr Ser Lys Gly Pro Lys
                885                 890                 895

Leu Ala Met Pro Trp Thr Phe His Ala Gly Tyr Arg Tyr Ser Trp
            900                 905                 910


<210> 5
<211> 910
<212> PRT
<213> Bordetella pertussis

<400> 5
Met Asn Met Ser Leu Ser Arg Ile Val Lys Ala Ala Pro Leu Arg Arg
  1               5                  10                  15

Thr Thr Leu Ala Met Ala Leu Gly Ala Leu Gly Ala Ala Pro Ala Ala
             20                  25                  30

His Ala Asp Trp Asn Asn Gln Ser Ile Val Lys Thr Gly Glu Arg Gln
         35                  40                  45

His Gly Ile His Ile Gln Gly Ser Asp Pro Gly Gly Val Arg Thr Ala
     50                  55                  60

Ser Gly Thr Thr Ile Lys Val Ser Gly Arg Gln Ala Gln Gly Ile Leu
 65                  70                  75                  80

Leu Glu Asn Pro Ala Ala Glu Leu Gln Phe Arg Asn Gly Ser Val Thr
                85                  90                  95

Ser Ser Gly Gln Leu Ser Asp Asp Gly Ile Arg Arg Phe Leu Gly Thr
            100                 105                 110

Val Thr Val Lys Ala Gly Lys Leu Val Ala Asp His Ala Thr Leu Ala
        115                 120                 125
```

```
Asn Val Gly Asp Thr Trp Asp Asp Asp Gly Ile Ala Leu Tyr Val Ala
    130                 135                 140

Gly Glu Gln Ala Gln Ala Ser Ile Ala Asp Ser Thr Leu Gln Gly Ala
145                 150                 155                 160

Gly Gly Val Gln Ile Glu Arg Gly Ala Asn Val Thr Val Gln Arg Ser
                165                 170                 175

Ala Ile Val Asp Gly Gly Leu His Ile Gly Ala Leu Gln Ser Leu Gln
            180                 185                 190

Pro Glu Asp Leu Pro Pro Ser Arg Val Val Leu Arg Asp Thr Asn Val
        195                 200                 205

Thr Ala Val Pro Ala Ser Gly Ala Pro Ala Ala Val Ser Val Leu Gly
    210                 215                 220

Ala Ser Glu Leu Thr Leu Asp Gly Gly His Ile Thr Gly Gly Arg Ala
225                 230                 235                 240

Ala Gly Val Ala Ala Met Gln Gly Ala Val Val His Leu Gln Arg Ala
                245                 250                 255

Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val Pro Gly Gly
            260                 265                 270

Ala Val Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Gly Gly Phe
        275                 280                 285

Gly Pro Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser Asp Ser Ser
    290                 295                 300

Val Glu Leu Ala Gln Ser Ile Val Glu Ala Pro Glu Leu Gly Ala Ala
305                 310                 315                 320

Ile Arg Val Gly Arg Gly Ala Arg Val Thr Val Ser Gly Gly Ser Leu
                325                 330                 335

Ser Ala Pro His Gly Asn Val Ile Glu Thr Gly Gly Ala Arg Arg Phe
            340                 345                 350

Ala Pro Gln Ala Ala Pro Leu Ser Ile Thr Leu Gln Ala Gly Ala His
        355                 360                 365

Ala Gln Gly Lys Ala Leu Leu Tyr Arg Val Leu Pro Glu Pro Val Lys
    370                 375                 380

Leu Thr Leu Thr Gly Gly Ala Asp Ala Gln Gly Asp Ile Val Ala Thr
385                 390                 395                 400

Glu Leu Pro Ser Ile Pro Gly Thr Ser Ile Gly Pro Leu Asp Val Ala
                405                 410                 415

Leu Ala Ser Gln Ala Arg Trp Thr Gly Ala Thr Arg Ala Val Asp Ser
            420                 425                 430
```

```
Leu Ser Ile Asp Asn Ala Thr Trp Val Met Thr Asp Asn Ser Asn Val
        435                 440                 445

Gly Ala Leu Arg Leu Ala Ser Asp Gly Ser Val Asp Phe Gln Gln Pro
    450                 455                 460

Ala Glu Ala Gly Arg Phe Lys Val Leu Thr Val Asn Thr Leu Ala Gly
465                 470                 475                 480

Ser Gly Leu Phe Arg Met Asn Val Phe Ala Asp Leu Gly Leu Ser Asp
                485                 490                 495

Lys Leu Val Val Met Gln Asp Ala Ser Gly Gln His Arg Leu Trp Val
            500                 505                 510

Arg Asn Ser Gly Ser Glu Pro Ala Ser Ala Asn Thr Leu Leu Leu Val
        515                 520                 525

Gln Thr Pro Arg Gly Ser Ala Ala Thr Phe Thr Leu Ala Asn Lys Asp
    530                 535                 540

Gly Lys Val Asp Ile Gly Thr Tyr Arg Tyr Arg Leu Ala Ala Asn Gly
545                 550                 555                 560

Asn Gly Gln Trp Ser Leu Val Gly Ala Lys Ala Pro Pro Ala Pro Lys
                565                 570                 575

Pro Ala Pro Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Gln
            580                 585                 590

Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala
        595                 600                 605

Ala Ala Asn Ala Ala Val Asn Thr Gly Gly Val Gly Leu Ala Ser Thr
    610                 615                 620

Leu Trp Tyr Ala Glu Ser Asn Ala Leu Ser Lys Arg Leu Gly Glu Leu
625                 630                 635                 640

Arg Leu Asn Pro Asp Ala Gly Gly Ala Trp Gly Arg Gly Phe Ala Gln
                645                 650                 655

Arg Gln Gln Leu Asp Asn Arg Ala Gly Arg Arg Phe Asp Gln Lys Val
            660                 665                 670

Ala Gly Phe Glu Leu Gly Ala Asp His Ala Val Ala Val Ala Gly Gly
        675                 680                 685

Arg Trp His Leu Gly Gly Leu Ala Gly Tyr Thr Arg Gly Asp Arg Gly
    690                 695                 700

Phe Thr Gly Asp Gly Gly Gly His Thr Asp Ser Val His Val Gly Gly
705                 710                 715                 720

Tyr Ala Thr Tyr Ile Ala Asp Ser Gly Phe Tyr Leu Asp Ala Thr Leu
                725                 730                 735
```

```
Arg Ala Ser Arg Leu Glu Asn Asp Phe Lys Val Ala Gly Ser Asp Gly
            740                 745                 750

Tyr Ala Val Lys Gly Lys Tyr Arg Thr His Gly Val Gly Ala Ser Leu
        755                 760                 765

Glu Ala Gly Arg Arg Phe Thr His Ala Asp Gly Trp Phe Leu Glu Pro
    770                 775                 780

Gln Ala Glu Leu Ala Val Phe Arg Ala Gly Gly Gly Ala Tyr Arg Ala
785                 790                 795                 800

Ala Asn Gly Leu Arg Val Arg Asp Glu Gly Gly Ser Ser Val Leu Gly
                805                 810                 815

Arg Leu Gly Leu Glu Val Gly Lys Arg Ile Glu Leu Ala Gly Gly Arg
            820                 825                 830

Gln Val Gln Pro Tyr Ile Lys Ala Ser Val Leu Gln Glu Phe Asp Gly
        835                 840                 845

Ala Gly Thr Val His Thr Asn Gly Ile Ala His Arg Thr Glu Leu Arg
    850                 855                 860

Gly Thr Arg Ala Glu Leu Gly Leu Gly Met Ala Ala Ala Leu Gly Arg
865                 870                 875                 880

Gly His Ser Leu Tyr Ala Ser Tyr Glu Tyr Ser Lys Gly Pro Lys Leu
                885                 890                 895

Ala Met Pro Trp Thr Phe His Ala Gly Tyr Arg Tyr Ser Trp
            900                 905                 910
```

<210> 6
<211> 922
<212> PRT
<213> Bordetella parapertussis

<400> 6

```
Met Asn Met Ser Leu Ser Arg Ile Val Lys Ala Ala Pro Leu Arg Arg
  1               5                  10                  15

Thr Thr Leu Ala Met Ala Leu Gly Ala Leu Gly Ala Ala Pro Ala Ala
             20                  25                  30

Tyr Ala Asp Trp Asn Asn Gln Ser Ile Ile Lys Ala Gly Glu Arg Gln
         35                  40                  45

His Gly Ile His Ile Lys Gln Ser Asp Gly Ala Gly Val Arg Thr Ala
     50                  55                  60

Thr Gly Thr Thr Ile Lys Val Ser Gly Arg Gln Ala Gln Gly Val Leu
 65                  70                  75                  80

Leu Glu Asn Pro Ala Ala Glu Leu Arg Phe Gln Asn Gly Ser Val Thr
                 85                  90                  95
```

```
Ser Ser Gly Gln Leu Phe Asp Glu Gly Val Arg Arg Phe Leu Gly Thr
            100                 105                 110

Val Thr Val Lys Ala Gly Lys Leu Val Ala Asp His Ala Thr Leu Ala
        115                 120                 125

Asn Val Ser Asp Thr Arg Asp Asp Asp Gly Ile Ala Leu Tyr Val Ala
    130                 135                 140

Gly Glu Gln Ala Gln Ala Ser Ile Ala Asp Ser Thr Leu Gln Gly Ala
145                 150                 155                 160

Gly Gly Val Arg Val Glu Arg Gly Ala Asn Val Thr Val Gln Arg Ser
                165                 170                 175

Thr Ile Val Asp Gly Gly Leu His Ile Gly Thr Leu Gln Pro Leu Gln
            180                 185                 190

Pro Glu Asp Leu Pro Pro Ser Arg Val Val Leu Gly Asp Thr Ser Val
        195                 200                 205

Thr Ala Val Pro Ala Ser Gly Ala Pro Ala Ala Val Phe Val Phe Gly
    210                 215                 220

Ala Asn Glu Leu Thr Val Asp Gly Gly His Ile Thr Gly Gly Arg Ala
225                 230                 235                 240

Ala Gly Val Ala Ala Met Asp Gly Ala Ile Val His Leu Gln Arg Ala
                245                 250                 255

Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val Pro Gly Gly
            260                 265                 270

Ala Val Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Leu Leu Asp
        275                 280                 285

Gly Trp Tyr Gly Val Asp Val Ser Asp Ser Thr Val Asp Leu Ala Gln
    290                 295                 300

Ser Ile Val Glu Ala Pro Gln Leu Gly Ala Ala Ile Arg Ala Gly Arg
305                 310                 315                 320

Gly Ala Arg Val Thr Val Ser Gly Gly Ser Leu Ser Ala Pro His Gly
                325                 330                 335

Asn Val Ile Glu Thr Gly Gly Gly Ala Arg Arg Phe Pro Pro Pro Ala
            340                 345                 350

Ser Pro Leu Ser Ile Thr Leu Gln Ala Gly Ala Arg Ala Gln Gly Arg
        355                 360                 365

Ala Leu Leu Tyr Arg Val Leu Pro Glu Pro Val Lys Leu Thr Leu Ala
    370                 375                 380

Gly Gly Ala Gln Gly Gln Gly Asp Ile Val Ala Thr Glu Leu Pro Pro
385                 390                 395                 400
```

```
Ile Pro Gly Ala Ser Ser Gly Pro Leu Asp Val Ala Leu Ala Ser Gln
                405                 410                 415

Ala Arg Trp Thr Gly Ala Thr Arg Ala Val Asp Ser Leu Ser Ile Asp
            420                 425                 430

Asn Ala Thr Trp Val Met Thr Asp Asn Ser Asn Val Gly Ala Leu Arg
        435                 440                 445

Leu Ala Ser Asp Gly Ser Val Asp Phe Gln Gln Pro Ala Glu Ala Gly
    450                 455                 460

Arg Phe Lys Val Leu Met Val Asp Thr Leu Ala Gly Ser Gly Leu Phe
465                 470                 475                 480

Arg Met Asn Val Phe Ala Asp Leu Gly Leu Ser Asp Lys Leu Val Val
                485                 490                 495

Met Arg Asp Ala Ser Gly Gln His Arg Leu Trp Val Arg Asn Ser Gly
            500                 505                 510

Ser Glu Pro Ala Ser Gly Asn Thr Met Leu Leu Val Gln Thr Pro Arg
        515                 520                 525

Gly Ser Ala Ala Thr Phe Thr Leu Ala Asn Lys Asp Gly Lys Val Asp
    530                 535                 540

Ile Gly Thr Tyr Arg Tyr Arg Leu Ala Ala Asn Gly Asn Gly Gln Trp
545                 550                 555                 560

Ser Leu Val Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln
                565                 570                 575

Pro Gly Pro Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro
            580                 585                 590

Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg Gln Pro Glu Ala Pro
        595                 600                 605

Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala Ala Asn Ala
    610                 615                 620

Ala Val Asn Thr Gly Gly Val Gly Leu Ala Ser Thr Leu Trp Tyr Ala
625                 630                 635                 640

Glu Ser Asn Ala Leu Ser Lys Arg Leu Gly Glu Leu Arg Leu Asn Pro
                645                 650                 655

Asp Ala Gly Gly Ala Trp Gly Arg Gly Phe Ala Gln Arg Gln Gln Leu
            660                 665                 670

Asp Asn Arg Ala Gly Arg Arg Phe Asp Gln Lys Val Ala Gly Phe Glu
        675                 680                 685

Leu Gly Ala Asp His Ala Val Ala Val Ala Gly Gly Arg Trp His Leu
    690                 695                 700
```

```
Gly Gly Leu Ala Gly Tyr Thr Arg Gly Asp Arg Gly Phe Thr Gly Asp
705                 710                 715                 720

Gly Gly Gly His Thr Asp Ser Val His Val Gly Gly Tyr Ala Thr Tyr
                725                 730                 735

Ile Ala Asn Ser Gly Phe Tyr Leu Asp Ala Thr Leu Arg Ala Ser Arg
            740                 745                 750

Leu Glu Asn Asp Phe Lys Val Ala Gly Ser Asp Gly Tyr Ala Val Lys
        755                 760                 765

Gly Lys Tyr Arg Thr His Gly Val Gly Val Ser Leu Glu Ala Gly Arg
    770                 775                 780

Arg Phe Ala His Ala Asp Gly Trp Phe Leu Glu Pro Gln Ala Glu Leu
785                 790                 795                 800

Ala Val Phe Arg Val Gly Gly Gly Ala Tyr Arg Ala Ala Asn Gly Leu
                805                 810                 815

Arg Val Arg Asp Glu Gly Gly Ser Ser Val Leu Gly Arg Leu Gly Leu
            820                 825                 830

Glu Val Gly Lys Arg Ile Glu Leu Ala Gly Gly Arg Gln Val Gln Pro
        835                 840                 845

Tyr Ile Lys Ala Ser Val Leu Gln Glu Phe Asp Gly Ala Gly Thr Val
    850                 855                 860

Arg Thr Asn Gly Ile Ala His Arg Thr Glu Leu Arg Gly Thr Arg Ala
865                 870                 875                 880

Glu Leu Gly Leu Gly Met Ala Ala Ala Leu Gly Arg Gly His Ser Leu
                885                 890                 895

Tyr Ala Ser Tyr Glu Tyr Ser Lys Gly Pro Lys Leu Ala Met Pro Trp
            900                 905                 910

Thr Phe His Ala Gly Tyr Arg Tyr Ser Trp
        915                 920


<210> 7
<211> 51
<212> PRT
<213> Bordetella bronchiseptica

<400> 7
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
  1               5                  10                  15

Pro Gly Gly Ala Val Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro
             20                  25                  30

Leu Leu Asp Gly Trp Tyr Gly Val Asp Val Ser Asp Ser Thr Val Asp
         35                  40                  45
```

Leu Ala Gln
50

<210> 8
<211> 46
<212> PRT
<213> Bordetella bronchiseptica

<400> 8
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
1 5 10 15

Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Leu Leu Asp Gly Trp
20 25 30

Tyr Gly Val Asp Val Ser Asp Ser Thr Val Asp Leu Ala Gln
35 40 45

<210> 9
<211> 56
<212> PRT
<213> Bordetella bronchiseptica

<400> 9
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Gly Val
1 5 10 15

Pro Gly Gly Ala Val Pro Gly Gly Phe Asp Pro Gly Gly Phe Gly Pro
20 25 30

Gly Gly Phe Gly Pro Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser
35 40 45

Gly Ser Thr Val Glu Leu Ala Gln
50 55

<210> 10
<211> 56
<212> PRT
<213> Bordetella bronchiseptica

<400> 10
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
1 5 10 15

Pro Gly Gly Ala Val Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro
20 25 30

Gly Gly Phe Gly Pro Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser
35 40 45

Gly Ser Ser Val Glu Leu Ala Gln
50 55

<210> 11
<211> 61
<212> PRT
<213> Bordetella bronchiseptica

<400> 11
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
1 5 10 15

Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Gly Gly Phe Gly Pro
20 25 30

Gly Gly Phe Gly Pro Gly Gly Phe Gly Pro Val Leu Asp Gly Trp Tyr
35 40 45

Gly Val Asp Val Ser Gly Ser Ser Val Glu Leu Ala Gln
50 55 60

<210> 12
<211> 56
<212> PRT
<213> Bordetella bronchiseptica

<400> 12
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
1 5 10 15

Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Gly Gly Phe Gly Pro
20 25 30

Gly Gly Phe Gly Pro Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser
35 40 45

Gly Ser Ser Val Glu Leu Ala Gln
50 55

<210> 13
<211> 51
<212> PRT
<213> Bordetella bronchiseptica

<400> 13
Gln Arg Ala Thr Ile Arg Arg Gly Asp Ala Pro Ala Gly Gly Ala Val
1 5 10 15

Pro Gly Gly Ala Val Pro Gly Gly Phe Gly Pro Gly Gly Phe Gly Pro
20 25 30

Val Leu Asp Gly Trp Tyr Gly Val Asp Val Ser Gly Ser Ser Val Glu
35 40 45

Leu Ala Gln
50

<210> 14
<211> 49
<212> PRT
<213> Bordetella bronchiseptica

<400> 14
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg Gln
20 25 30

Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala
35 40 45

Ala

<210> 15
<211> 52
<212> PRT
<213> Bordetella bronchiseptica

<400> 15
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro
20 25 30

Gln Arg Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu
35 40 45

Leu Ser Ala Ala
50

<210> 16
<211> 59
<212> PRT
<213> Bordetella bronchiseptica

<400> 16
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Gly Pro Gln Pro Gly Pro Gln Pro Gly Pro Gln Pro Pro Gln
20 25 30

Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg Pro Glu Ala Pro Ala Pro
35 40 45

Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala
50 55

<210> 17
<211> 52
<212> PRT
<213> Bordetella bronchiseptica

<400> 17
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Gly Pro Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro
20 25 30

Pro Gln Arg Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu
35 40 45

Leu Ser Ala Ala
50

<210> 18
<211> 56
<212> PRT
<213> Bordetella bronchiseptica

<400> 18
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Gly Pro Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro
20 25 30

Pro Gln Pro Pro Gln Arg Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro
35 40 45

Ala Gly Arg Glu Leu Ser Ala Ala
50 55

<210> 19
<211> 58
<212> PRT
<213> Bordetella bronchiseptica

<400> 19
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Gly Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro
20 25 30

Gln Pro Pro Gln Pro Pro Gln Arg Gln Pro Glu Ala Pro Ala Pro Gln
35 40 45

Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala
50 55

<210> 20
<211> 48
<212> PRT
<213> Bordetella bronchiseptica

<400> 20
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Arg Gln Pro
20 25 30

Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala
35 40 45

<210> 21
<211> 52
<212> PRT
<213> Bordetella bronchiseptica

<400> 21
Gly Ala Lys Val Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Gln Pro
20 25 30

Gln Pro Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly Arg Glu
35 40 45

Leu Ser Ala Ala
50

<210> 22
<211> 54
<212> PRT
<213> Bordetella bronchiseptica

<400> 22
Gly Ala Lys Val Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Pro Gln Pro Gln Pro
20 25 30

Gln Pro Gln Pro Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala Gly
35 40 45

Arg Glu Leu Ser Ala Ala
50

<210> 23
<211> 42
<212> PRT
<213> Bordetella bronchiseptica

<400> 23
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Pro Gln Pro Pro Gln Pro Gln Pro Glu Ala Pro Ala Pro Gln
20 25 30

Pro Pro Ala Gly Arg Glu Leu Ser Ala Ala
35 40

<210> 24
<211> 39
<212> PRT
<213> Bordetella bronchiseptica

<400> 24
Gly Ala Lys Ala Pro Pro Ala Pro Lys Pro Ala Pro Gln Pro Gly Pro
1 5 10 15

Gln Pro Pro Gln Pro Gln Pro Glu Ala Pro Ala Pro Gln Pro Pro Ala
20 25 30

Gly Arg Glu Leu Ser Ala Ala
35

<210> 25
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic peptide

<220>
<221> MOD_RES
<222> (3)..(4)
<223> Phe Asp, Phe Gly or Ala Val

<400> 25
Gly Gly Xaa Xaa Pro
1 5